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Executive Summary

Background

This study examined the extent to which suicide in U.S. Navy populations differed relative to comparable civilian populations and addressed the following research questions: (1) Are Navy active-duty personnel at higher risk for completed suicide than their employed civilian counterparts? (2) Relative to employed civilians, what are the highest risk demographic groups? and (3) What are the trends in rates over time and space (e.g., clustering effects) and how do they compare with civilian trends?

Approach

Age-, sex-, race-, and employment-adjusted rates were calculated for sailors committing suicide between 1990 and 1996 and compared with adjusted rates for civilians calculated from national mortality records. Cluster analyses were conducted on annual rates from 1983 through 1995 to examine differences between comparison groups across time and location.

Results

Results showed fewer than expected suicides for Caucasian and African American males and a somewhat higher than expected suicide rate among other ethnic group males and among Caucasian women. The suicide rate appears to be increasing in recent years, with some evidence toward a clustering effect in time and space.

Conclusions

Continued research efforts should examine the relationships between completed suicides, gestures, and attempts, and organizational and environmental factors in the Navy to identify risk factors and opportunities for intervention.

Between 1950 and 1980, the youth suicide death rate in the United States more than tripled and has remained fairly stable since that time.[1] Completed suicide is the third leading cause of death among 17- to 24-year-olds in the United States, and in the military it is surpassed only by accidents and homicide.[2-5] Previous studies of suicide among active-duty military personnel of all branches have usually shown that the age-specific rates for suicide in the military are lower than the age-specific rates for the general U.S. population.[3-14] In the Navy, the 1980 to 1992 mortality rate for completed suicide was 11 per 100,000 active-duty personnel, in contrast to a U.S. general population rate of 15 per 100,000.[8] In fact, a recent study examining rates across all four armed services showed the Navy to have the lowest annual rates of all branches of service for both men and women (11.74 and 4.82 per 100,00, respectively).[10]

Yet the Commander-in-Chief, Pacific Fleet, has expressed concern that suicide remains the third leading cause of death among sailors.[15] Suicide is a statistically rare event that is multidetermined and exceedingly difficult to predict or prevent.[16,17] It is a tragedy for the sailor's family and friends and a likely detriment to the morale of the unit. Suicidal behavior entails loss of trained personnel, as well as a drain on medical and health care resources. The extent of the impact remains unclear. A common perception that suicide is an important issue in the military in general, and within the Navy in particular, persists despite a 1985 Health Studies Task Force, which concluded that due to the low base rate, "the DoD does not have a major problem with suicide by active-duty members."[6] This perception stems, in part, from media attention surrounding the suicide of Admiral Boorda in May 1996; "clustered" events (e.g., 3 suicides on one ship within one 6-month deployment);[18] an imitative pattern of suicidal behavior in a Navy school,[7] and from reports of increasing rates within the Navy that may not be experienced by the

other services.[14] The issue of whether suicide is a problem in the military may be due in part to the lack of studies comparing active-duty suicide rates with employed U.S. civilian rates. Since unemployed men have higher suicide rates than employed men,[19] a more appropriate comparison group for active-duty personnel should be drawn from employed civilians. It has also been found that among suicides that occur in the workplace, men in military service appeared at highest risk.[20] Military occupations related to the use of, or access to, firearms have also been associated with a significant risk of suicide in comparison with other military occupations.[9] It is possible that active-duty Navy suicide rates are higher when properly compared with employed civilian rates, thus identifying a potential problem area.

Further, suicide rates vary greatly according to demographic variables, such as age, gender, and race. The percentage distribution of the U.S. Navy across these groupings is very different from that of the population in general. In particular, it should be noted that the Navy is a younger population than that of the United States on the whole: the maximum age in the Navy is 65, while about 32% of the general population is over 65; the Navy is more than 70% male, while in the general population the distribution is roughly half male and half female. Further, the distribution among racial groups in the military does not mirror that of the general population. For example, 12% of the U.S. population is African American, while for the Navy, the percentage is 18%. These considerations are important because suicide rates for the U.S. population are considerably higher among whites than among blacks and among men than among women.[21,22] In addition, among white males (the group amongst whom suicides are the highest), suicide rates tend to increase with age. Thus, only by allowing for these demographic variables could a valid comparison be made between the number of suicides occurring among Navy

personnel and the number of suicides that might be expected to occur if Navy suicide rates were to reflect those of the general population.

The Navy has a long history of addressing these issues in its research on the epidemiology of suicide in the Navy and Marine Corps. In the first study that assessed suicide incidence in the Navy, Schuckit and Gunderson[4] reported that between July 1965 and January 1972, the overall rate for enlisted men in the Navy was 8 per 100,000 and for officers, 9 per 100,000. The rate of completed suicide for all Navy men in a subsequent study period between 1966 and 1977 was 7.2 per 100,000[12] and between 1974 and 1985, the mortality rate for completed suicide among enlisted personnel was 6.59 per 100,000 person-years.[14] The most recent study of Navy suicides found the overall rate to have increased to 11.01/100,000 active-duty personnel and rates for enlisted personnel to be two times higher than for officers.[8] Both men and women, however, had lower than national rates. These studies have described the composite Navy suicide as a second-term enlisted (E4 to E6) white male, 26.7 years old, who killed himself with a firearm.[8,11] However, they also point to the potential changing risk profile of suicide in the military and the need to examine and monitor trends across time, with appropriate adjustments for demographics and employment. Thus, in the current study we examined completed Navy suicides from 1983 through the present, focusing on adjusted mortality rates, demographic distributions, trends, and potential clustering of suicides in the Navy from 1990 to 1995.

The specific aim of this study was to determine whether rates of suicide in the Navy were significant enough to justify increased research and intervention efforts (i.e., whether the rates are indeed higher than those of the civilian population). This paper examines the extent to which

suicide in active-duty Navy populations differs relative to comparable civilian populations. It addresses some of the limitations of previous studies by utilizing epidemiological methods with sufficient statistical control to allow unambiguous answers to the following research questions: (1) Are Navy active-duty personnel at higher risk for completed suicide than their employed civilian counterparts? (2) Relative to employed civilians, what are the highest risk demographic groups? and (3) What are the trends in rates over time and space (e.g., clustering effects), and how do they compare with civilian trends?

Methods

To ascertain whether suicide rates in the Navy are higher than what would be expected in the civilian population, analyses of extant data were conducted. For Navy rates, data were obtained from death certificates (Report of Casualty DD Form 1300) and computerized Career History files maintained at the Naval Health Research Center, San Diego, California. These records contain demographic information on the deceased, rank, method of suicide, time and place of suicide, and duty station at the time of death. To ensure complete case ascertainment and data accuracy, these files were reviewed in conjunction with Judge Advocate General death investigation reports, when available. These records were used to calculate crude annual suicide rates (number of suicides per 100,000 population) for the years 1983 to 1995. Specific rates were also computed for males and females in each of the age groups (17-19, 20-24, 25-34, 35-44, 45-54, and 55-65).

For civilian rates, data were obtained from computerized national public-use databases of civilians, including the Centers for Disease Control (CDC)[23,24] and the National Longitudinal

Mortality Study (NLMS).[25,26] The NLMS, the only known source of information on mortality rates among U.S. employed and unemployed people, followed a total of 1.3 million people in 12 cohorts over the period from 1979 to 1985. Updated data from that study were provided by its author and were used to adjust the expected suicide rates for employment status.

Computation of Rates

To address the first research question of comparative suicide rates in active-duty personnel, all suicides reported in the Navy between January 1, 1990 and December 31, 1995 were examined. Age- and employment-adjusted suicide rates were calculated and used to compare Navy and U.S. population groups by gender and ethnicity. To compare suicide rates in the Navy with those in the general population, expected numbers of suicides in the Navy were computed for each of the years from 1990 to 1995. For each year the number of active-duty personnel in each cross-classification by sex (M, F), race (White, Black, and other), and age group was computed. For each sex-age-race cross-classification, an expected number of suicides was computed using national rates provided by the CDC.[23,24] Thus, for each sex-age-race cross-classification, a standardized mortality ratio (SMR) was computed. This SMR was computed by dividing the observed number of deaths by the expected number and then multiplying by 100%. Thus, an SMR greater than 100 represented a suicide rate greater than that found in the general population. SMRs for more general groupings (e.g., males or Blacks) were computed by summing the expected numbers across the subgroups contained in that group and dividing this number into the observed number for that group. The 95% confidence intervals for the estimation

of the indirectly standardized mortality ratios were calculated for estimates of a Poisson-distributed variable according to the procedure described in Lilienfeld and Lilienfeld.[27]

Based on averaged age-specific rates of suicide for employed respondents to the NLMS, an "adjustment for employment" was applied to national suicide rates. This adjustment was computed by comparing the suicide rates of the employed population (in each sex and age group) with those of the general population and computing the ratio. Total person-years were multiplied by the ratios and summed to obtain a weighted average. The highest weighted average among demographic groups was 78.1 in White males and 64.5 in Black females. A conservative adjustment for employment was obtained by rounding these averages to .80 and .70 for men and women, respectively, and computing expected suicide rates among employed males to be 80% of overall rates for men and 70% of overall rates for women. Expected rates calculated using the individual employed rates for each cell were very similar to those obtained using this weighted average of ratios (i.e., none varied by more than 1). However, this latter method was chosen over direct estimation of expected employment rates because due to considerable variation across age groups with some very small cells, particularly among employed Black males, it was likely to yield more-stable estimates.

Frequency tables were also computed to ascertain whether significant differences existed between Navy personnel and the general population in the method of suicide. Tables were computed separately for males and females since method and gender are known to be highly dependent among suicides, with males preferring guns and females preferring poisoning and

asphyxiation. SMRs were again computed to show the distribution of expected to observed rates by demographic subgroup.

Computation of Trends and Clusters

Crude Navy and U.S. annual suicide rates were computed to assess trends over the last 13 years. Crude and age-adjusted annual rates were calculated from the above previously described data sets to address the second question. The Knox technique of space-time cluster analysis, as adapted by Gould et al.,[28-31] was used to determine the proportion of suicides that occurred in clusters among Navy active-duty members. This technique assessed whether the number of suicides occurring close in space and time was significantly greater than what could be expected by chance alone. This method was chosen over alternative methods because of its applicability to and successful experience with suicide data.

Knox's method as applied to these data may be summarized as follows: for each suicide, the date and place of death were obtained. Criterion for "closeness" in time and criterion for "closeness" in space were decided upon (i.e., 2 weeks and same duty station), and the following numbers were noted: the number of pairs of suicides occurring that were "close" in time (T), the number of pairs of suicides that were "close" in space (S), and the number of pairs of suicides that were "close" in both time and space (B). The total number of pairs in the data were also computed N (i.e., if there are *n* suicides, the total number of pairs will be n(n-1)/2). The Knox method tests the null hypothesis that the event of a pair of suicides being close in time is independent of the event that they will be close in space. This is equivalent to saying that the

probability of closeness in time and space is the product of the two probabilities for closeness in time and closeness in space. Under this hypothesis the expected number of pairs close in both time and space is estimated to be T x S/N. Assuming that the number of events being close in time and space has a Poisson distribution with parameters estimated by this latter quantity, a *p*-value for the data is obtained by computing $p(Y \geq B)$, where Y has parameter $\lambda = T \times S/N$. A "small" *p*-value may be taken as evidence of a clustering effect.

Results

During the period from 1983 to the present, 810 suicides were recorded among active-duty Navy personnel. The crude suicide rate in the Navy for the year 1995 was 15.6 cases per 100,000, while the comparable rate for the U.S. population was about 12.0. Figure 1 shows that the crude suicide rate in the Navy has increased each year since 1990. Crude suicide rates are, of course, not a valid measure for comparing populations, since suicide rates vary among different age, sex, and racial groups. Even computing a standardized rate can mask important trends.[32] Table I provides an annual breakdown by sex and race of the number of suicides in the Navy from 1990 to 1995, years for which a demographic breakdown of active-duty naval personnel by age, sex, and race was available. In each cell, the observed number (O) of suicides is given, with the expected number (E) in parentheses. The expected numbers have been computed and adjusted for age, according to the suicide rates of the general U.S. population. Looking at the totals for each sex/race group, it can be seen that the only category which produces an excess of observed over expected suicides is the category "Other" males (Asian/Pacific Islander/Native American), in which 31 suicides were observed and 20.8 were

expected. The only other category in which the number of suicides observed comes close to the expected number is that of "white females" (11 observed suicides compared with 8.5 expected). Figure 2 shows the SMRs and confidence intervals for each group and illustrates which had suicide rates less than and greater than those found in the general population It was also noted that for Other males, both employment-adjusted and unadjusted SMRs were greater than for the general population (adjusted SMR=149; 95% C.I. = 100.60 – 213.12), while for white women, the adjustment for employment moved the expected rate from an unadjusted rate of 91 to 130 (95% C.I. = 64.58 – 231.65). The small number of white women and the large confidence interval, however, precludes a definitive assessment of these rates.

Table II compares the observed number of deaths in each age group with the expected numbers. In each cell the expected numbers have been computed with adjustment for race. For each age category for males, the observed number is about half of the expected number, while for females, largely due to the 20-24 years age group, there is an excess of observed to expected suicides, though the actual numbers are small.

When the distribution of suicides by paygrade was examined, enlisted personnel in ranks E4-E6 had the highest proportion of suicides, and officers had the lowest. These proportions were significantly greater than the proportion of E4-E6s in the overall Navy population and less than the proportion of officers in the overall Navy population ($X^2_3 = 14.8$, $p = .0019$) (Fig. 3).

There also appeared to be differences in the methods chosen by Navy suicides and those in the general population, but these differences were statistically significant only among men. Among both men and women in the general population, firearms were the most commonly used

instrument for suicide. While firearms were also the most commonly used method of suicide among Navy men, a greater proportion of both Navy men and women tended to favor poison (this included pills) compared with the population as a whole (Table III).

In the cluster analyses, two suicides were defined as close in time if they occurred within 14 days of each other, and as close in space if they occurred at the same duty station. Of the 810 suicides, 728 had both the time of death and duty station at death recorded, thus there were 264,628 potential combinations or pairings of suicides. Of these, 1,565 pairs occurred within 14 days of each other, 362 pairs in which each suicide occurred at the same duty station, and 6 pairs occurred at the same duty station within 14 days of each other (Table IV).

Under the null hypothesis of independence between space and time, the estimated expected number of suicides that were close in both is 362 x 1,565/264,628 or 2.679. A *p*-value was computed by finding the probability $Pr(Y \geq 6)$ where Y has a Poisson distribution with parameter $\lambda = 2.141$. This probability is .022, evidence that the number of suicides coinciding in both space and time is slightly more than might be expected. Table V summarizes the results obtained when considering different definitions of closeness in time. The following time frames were considered: 1 week (7 days), 2 weeks (14 days), 3 weeks (21 days), and 4 weeks (28 days).

Discussion

Overall, results of analyses of Navy suicides between 1990 and 1995 showed fewer than expected suicides for White or Black males and a somewhat greater than expected number of suicides among Asian/Pacific Islander/Native American males and among White women. The

suicide rate appears to have increased in recent years, with some evidence toward a clustering effect in time (defined as a 14-day period) and space (defined as within the same duty station).

Several findings are consistent with those available from studies of other military services. For example, recent U.S. Army research found similar SMRs for white and black males.[33] Studies of Army, Air Force, and Marine Corps suicides have shown suicide rates among all of the military branches reflect those of the nation in that males were more likely to commit suicide than were females, and whites were more likely to commit suicide than blacks. Also, across all services, enlisted personnel were more likely to commit suicide than were officers. There has been some variation, however, in the methods of suicide used between Navy, all military, and national populations. Whereas firearms and hanging have accounted for approximately 75% of the choice in methods among all military and civilian men,[8] these methods accounted for only 60% among Navy men. One possible explanation is that Navy personnel may have less access to firearms than other military personnel or are less likely than others to own a handgun. Helmkamp cited historical military data that indicate more than 90% of suicides occur while the individual is not on duty.[8] Other recent data showed persons who committed suicide were more likely than control subjects to have a history of family handgun purchase.[34] Such an explanation may also account for the lower rate of suicide found in the Navy relative to the other services. Subsequent studies will perform similar analyses in Marine Corps personnel, the military branch with the highest suicide rate.

Also consistent with previous studies, this study found the overall number of suicides in the Navy was less than what would be expected in the general U.S. population. This was the case even when controlling for age, sex, and racial differences between the Navy and U.S.

populations, and when controlling for employment status. The two exceptions--other ethnic group males and white females--are potentially high-risk demographic subgroups that deserve additional research attention. The advantage of using adjusted ratios of expected to observed numbers of suicides, rather than the rates used in previous studies, is that they allow a more direct comparison with the general population, especially for events with quite low base rates. For this reason, to our knowledge, this is the first time that "other" ethnic group males have been identified as potentially high risk, although Helmkamp did find that suicide rates (per 100,000) for "other" males in the military were slightly higher than those for black males.[8] It is known that Native Americans have high suicide rates in the general population, however, their numbers are extremely low in the Navy, and it is unlikely that they could account for the excess in the expected rates. Anecdotal evidence suggests that it is more likely to be the Pacific Islanders who account for a large proportion of the excess. Since the definition of "other ethnic" tends to be different across studies (e.g., some include Hispanics, some do not), it is difficult to obtain comparative data. Certainly, a more detailed investigation of this group is needed. The present study also supports Helmkamp's finding of higher rates for white females in the military than for females in the national population across all age groups.[8] Due to few female suicides in previous studies of military suicides, women have often been excluded from analyses.[9,12,14] However, with a greater proportion of women now serving in the military, current findings may point to a small but increasing risk population.

Despite the lower overall rate, of potential concern to Navy leadership and policy makers is the notable increase in suicide rates, especially between 1990 and 1995. This is seen in both crude and age-adjusted rates. Although some researchers have noted an increase in suicide

among young black males in the civilian population that did not appear among civilian white males,[36,37] the increase in Navy suicides appears to be accounted for by white males, particularly in 1995. Black Navy suicides did in fact increase between 1990 and 1994, but then decreased in 1995. It has been suggested that such suicide rate fluctuations in the civilian sector are associated with unemployment rates.[38] Although this is the first study that has attempted to control for unemployment when comparing military and national suicide rates, one of the limitations of the present study is that the adjustment for employment is more conservative for blacks than for whites. That is, suicide rates among employed blacks were lower than rates among employed whites, and they included some age groups with no reported suicides. Therefore, the employment adjustments, while somewhat conservative for whites, may have overestimated the expected number among blacks. Due to the small numbers of suicides among blacks, the conservative estimates were expected to yield more stable estimates but may, however, have been less sensitive to shifts in unemployment rates.

Another limitation of the present study, as with all studies of suicide, is the possibility of underreporting. It is unknown to what degree underreporting of suicide and/or misclassification of suicides as accidental deaths occur in the military or in the general population, or whether the proportion underreported between military and national populations significantly differ. It is likely, however, that the military's required suicide prevention programs and psychological autopsies help to ascertain as many cases as possible. On the other hand, military laws that criminalize attempted suicide may work against disclosure of information needed to make proper cause of death determinations.[39]

The overall lower military suicide rates relative to the national rates have generally been attributed to screening procedures and healthy worker effects, as well as to favorable psychosocial factors, such as the social cohesion within a military unit.[33] To understand the increases in expected rates observed in the present study, an examination of risk factors will be of particular importance. Although most studies have found that risk factors for suicide in the military mirror those of the general population (i.e., interpersonal loss, depression, substance abuse, and work problems),[5,11,39] at least one study has noted that interpersonal separation was more often the precipitating event of the suicide among young military personnel than among civilian suicides.[40] It is possible that while white males may feel themselves more vulnerable to economic concerns in a downsizing military (but still remain at lower risk than in the general population), other ethnic group men and White women may not be subjected to the same screening procedures and/or healthy worker effects. Alternatively, they may be more vulnerable to emotional distress, including depression, surrounding separation issues given potential cultural differences and greater family concerns that may jeopardize social support. A new study is under way to corroborate high-risk groups identified from this study and to examine a wide range of risk factors among hospitalized suicide attempters and among self-reported suicide contemplators. It is anticipated that such data will help develop a comprehensive profile of Navy personnel at suicide risk to enhance detection capability and provide data-driven intervention and prevention strategies.

The evidence for a clustering of Navy suicides may be an important finding for intervention purposes. Few previous studies have examined the temporal variation of suicidal behavior in the Navy. Although a case study has described an apparent imitative suicide in an

active-duty military population, no evidence was found for temporal variation (season, month, day of week, or national holiday) in a previous study of completed suicide in the Navy.[41] The use of the Knox technique, which takes into consideration the locations of the suicides as well as the dates committed, may account for the difference in findings. In other words, imitative suicides in the Navy appear to be focused within the duty station and within a limited period of time following an initial suicide. A recent study of New Zealand suicides found a similar absence of clusters in time alone, but also noted a significant pattern of time-space clusters.[27]

Conclusions

Adjusting for age and employment, the overall Navy suicide rate is two-thirds that of the general U.S. population. However, there may be cause for concern regarding an overall increase in suicides among Navy personnel and a higher than expected number of suicides among Asian/Pacific Islander/Native American men and White women, though estimates of rates are imprecise due to low numbers of cases. Continued research efforts should examine the relationships between completed suicides, gestures, and attempts, and organizational and environmental factors in the Navy to identify risk factors and opportunities for intervention. Targeting intervention efforts within a duty station approximately 2 weeks after suicide occurrence may reduce imitative suicides.

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TABLE I

NAVAL SUICIDES BY RACE AND SEX, 1990-1995.*

	Male			Female			
Year	White	Black	Other	White	Black	Other	Total
1990	41 (83.5)	4 (13.1)	6 (4.0)	3 (1.6)	0 (0.3)	0 (0.1)	54 (102.6)
1991	51 (79.6)	4 (12.5)	4 (3.8)	1 (1.5)	0 (0.3)	0 (0.07)	60 (97.8)
1992	44 (75.7)	12 (11.9)	5 (3.6)	1 (1.4)	0 (0.3)	0 (0.07)	62 (93.0)
1993	44 (71.1)	9 (11.2)	4 (3.4)	3 (1.4)	0 (0.3)	0 (0.07)	60 (87.5)
1994	39 (65.5)	10 (10.3)	6 (3.1)	2 (1.3)	0 (0.2)	0 (0.07)	57 (80.5)
1995	58 (61.4)	4 (9.6)	6 (2.9)	1 (1.2)	0 (0.2)	0 (0.07)	69 (75.4)
Total	277 (436.8)	43 (68.6)	31 (20.8)	11 (8.5)	0 (1.6)	0 (0.5)	362 (536.8)

*Observed numbers with expected numbers in parentheses. The expected numbers have been computed adjusting for age and for employment.

Table II

NAVAL SUICIDES BY AGE GROUP, 1990-1995*

Age Group	Male	Female	Total
15-19	18 (29.5)	0 (0.8)	18 (30.3)
20-24	133 (228.8)	6 (2.9)	139 (231.7)
25-34	139 (202.2)	3 (4.3)	142(206.5)
35-44	55 (95.0)	2 (2.4)	57 (97.4)
45-54	6 (10.3))	0 (0.2)	6 (10.5)
55-64	0 (0.4)	0 (0.0)	0 (0.4)
Total	351 (526.3)	11 (10.6)	362 (536.9)

*Observed values with civilian expected values in parentheses adjusted for race and employment.

Table III

PERCENTAGES OF NAVAL SUICIDES BY GENDER AND METHOD USED, 1983-1995*

Method	Men	Women
	Navy (U.S. Pop)	Navy (U.S. Pop)
Poison and asphyxiation	32.1 (13.3)	51.7 (37.1)
Strangulation and hanging	4.9 (15.6)	3.4 (14.2)
Firearms	55.4 (64.6)	41.4 (39.3)
Cutting and stabbing	1.3 (1.4)	0.0 (1.3)
Other	6.3 (5.0)	3.4 (8.0)
Total	100% (100%)	100% (100%)
Test statistic	$\chi^2_4 = 275.7, p < .0001$	$\chi^2_4 = 5.2, p = .26$

*Equivalent percentages for the general U.S. population in parentheses.

TABLE IV

SUICIDE PAIRS (1983-1995) CLASSIFIED BY CLOSENESS IN TIME (14 DAYS), AND CLOSENESS IN SPACE (SAME DUTY STATION).

Space\Time	Close in time	Not close in time	Total
Same duty station	6	356	362
Different duty station	1559	262,707	264,266
Total	1565	263,063	264,628

*$N = 728$.

Table V

ANALYSIS OF 728 SUICIDES (1983-1995) BY KNOX'S METHOD FOR EVIDENCE OF CLUSTERING IN SPACE AND TIME

Time difference	Observed pairs of suicides (Obs)	Expected pairs of suicides (Exp)	P-Value (P[Y Obs])
7 days	3	1.129	.105
14 days	6	2.141	.022
21 days	6	3.142	.099
28 days	7	5.263	.134

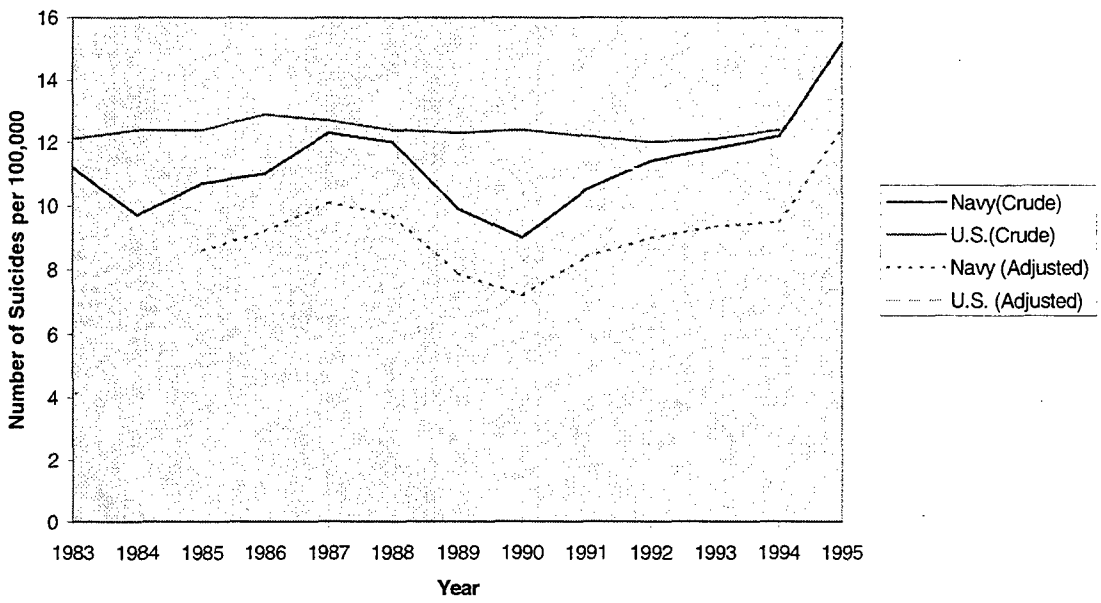

Fig. 1. Crude and age-adjusted suicide rates: Navy vs. U.S. population

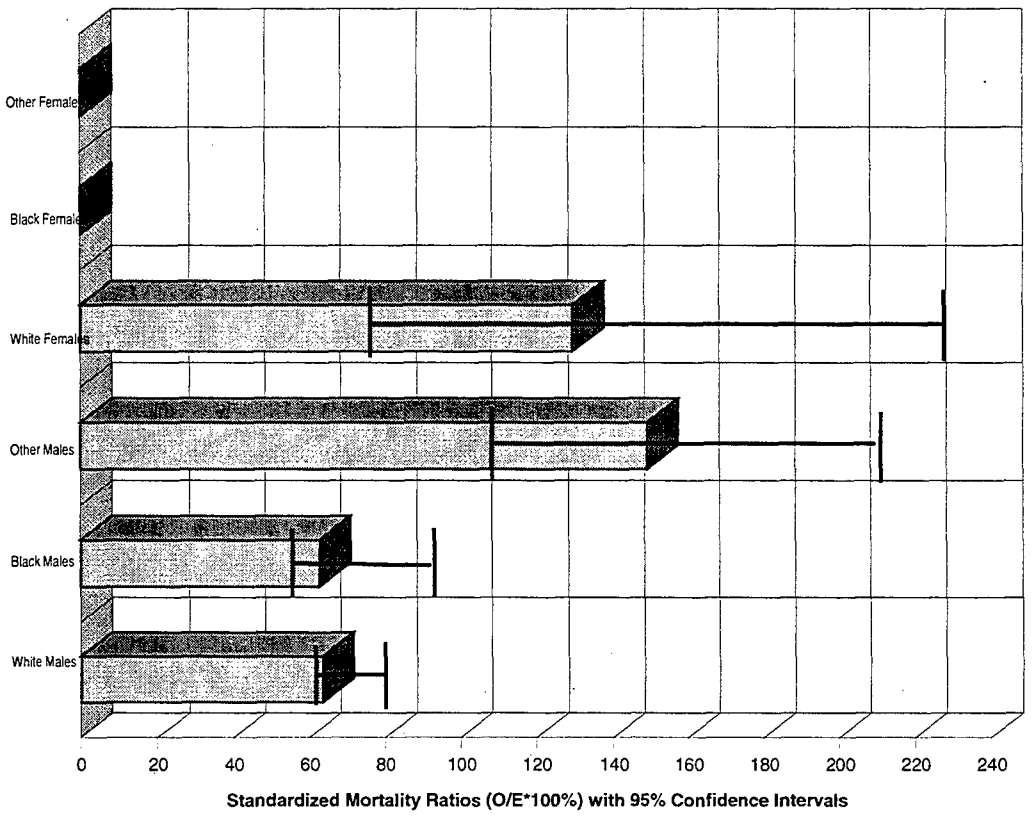

Fig. 2. Navy observed/expected suicides, 1990-1995, adjusted for age and employment

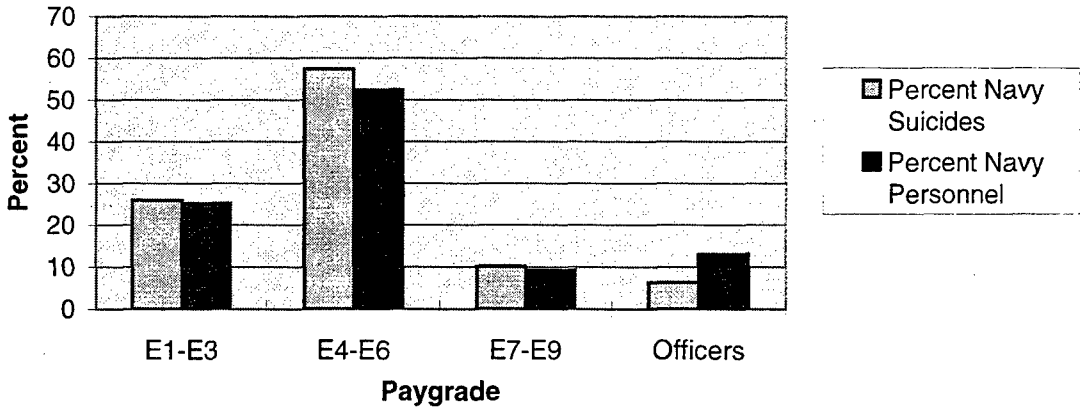

Fig. 3. Percentage of Navy suicides and personnel by paygrade, 1990-1995

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13. ABSTRACT *(Maximum 200 words)*

This study examined the extent to which suicide in U.S. Navy populations differed relative to comparable civilian populations and addressed the following research questions: (1) Are Navy active-duty personnel at higher risk for completed suicide than their employed civilian counterparts? (2) Relative to employed civilians, what are the highest risk demographic groups? and (3) What are the trends in rates over time and space (e.g., clustering effects) and how do they compare with civilian trends? Age-, sex-, race-, and employment-adjusted rates were calculated for Sailors committing suicide between 1990 and 1996 and compared with adjusted rates for civilians calculated from national mortality records. Cluster analyses were conducted on annual rates from 1983 through 1995 to examine differences between comparison groups across time and location. Results showed fewer than expected suicides for Caucasian and African American males and a somewhat higher than expected suicide rate among other ethnic group males and among Caucasian women. The suicide rate appears to be increasing in recent years, with some evidence toward a clustering effect in time and space.

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